

Inclusive Charm Production in Two Photon Collisions at LEP with the L3 Detector

Alan L. Stone

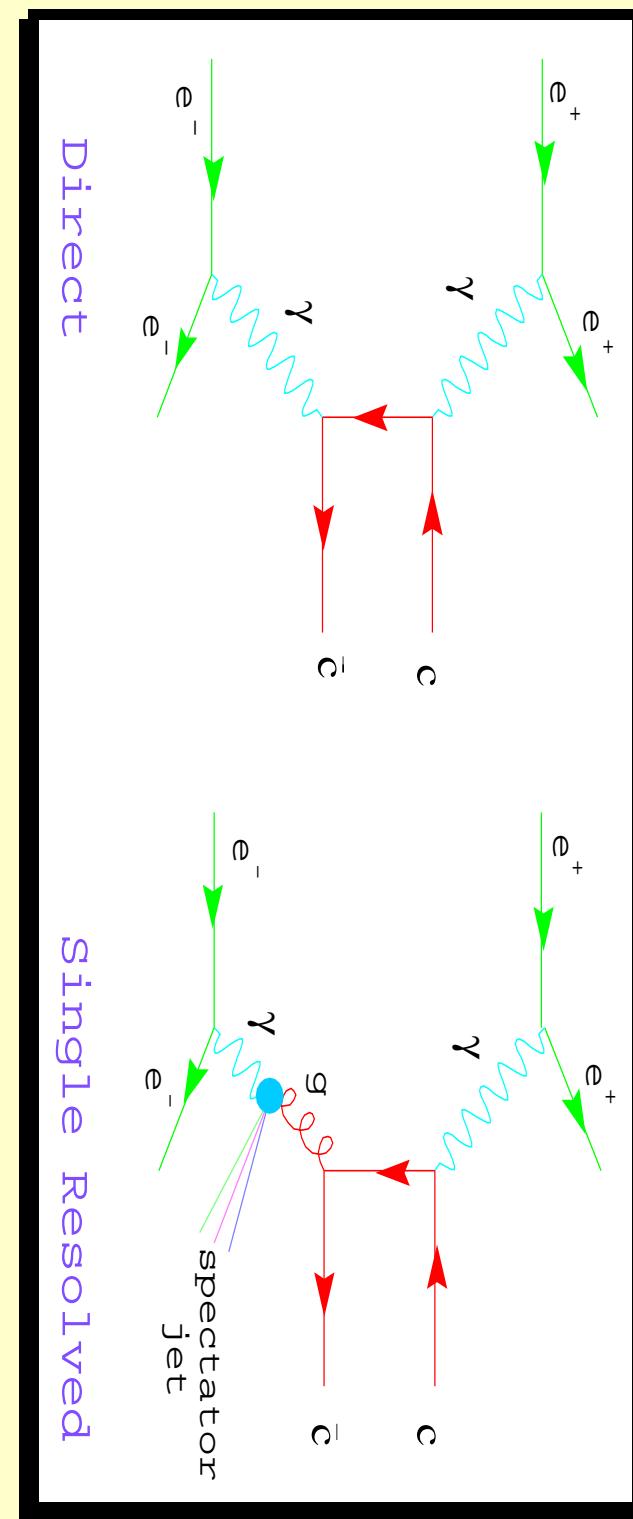
Louisiana State University

21 - 28 March 1998
Rencontres De Moriond
Les Arcs, Savoie, France

- Motivation
- Analysis
- Results (**Preliminary**)



Motivation



- Test of QCD
- Gluon content of Photon (**resolved**...)
- Constrain Mass of Charm Quark
- First LEP2 measurement

$$\int \mathcal{L} dt = 165 \text{ pb}^{-1} \text{ at } \sqrt{s} = 91 - 183 \text{ GeV}$$

Event Selection

Hadron Selection: $e^+e^- \rightarrow e^+e^- + \text{hadrons}$

Lepton Selection: $c \rightarrow \text{lepton(s)}$

μ^\pm Selection

$$|\cos \theta| < 0.90$$

$$P_\mu > 2 \text{ GeV}/c$$

$$P_\mu < 0.2E_{\text{beam}}$$

e^\pm Selection

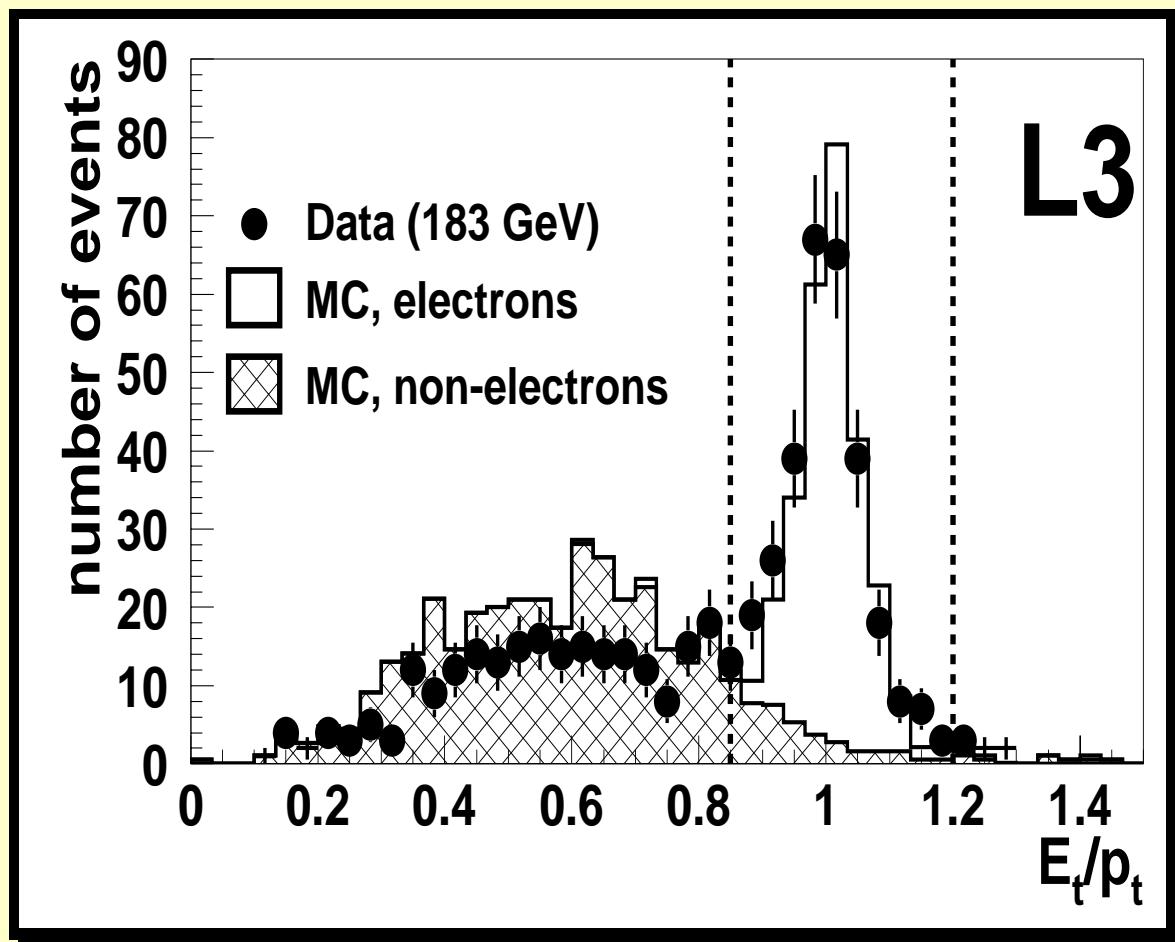
$$|\cos \theta| < 0.72$$

$$E_e > 0.5 \text{ GeV}$$

$$\Delta\phi < 20\text{mrad}$$

$$0.85 < dE/dx < 1.15$$

$$0.85 < E_T/p_T < 1.2$$



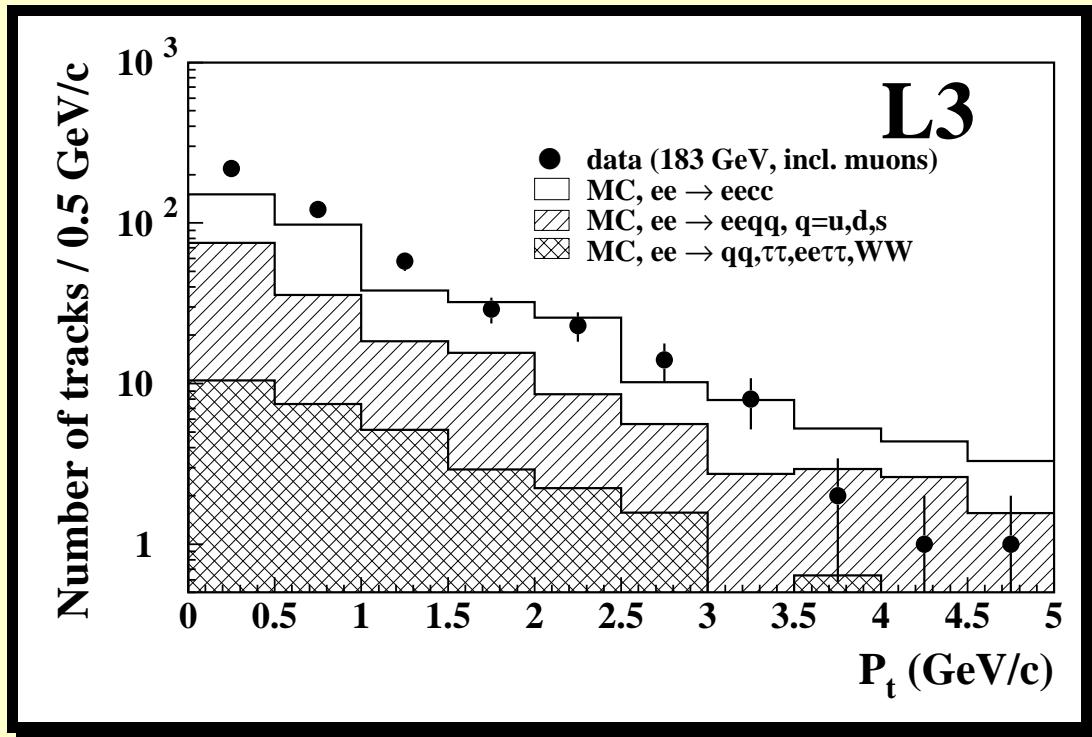
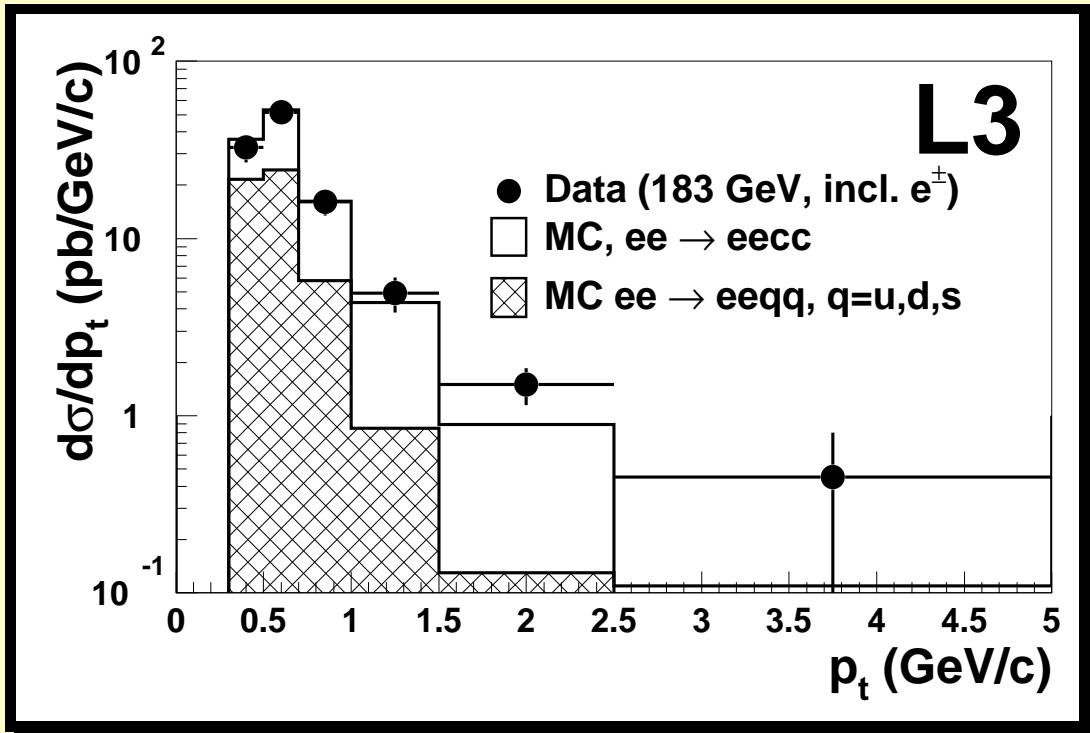
MC: PYTHIA vers. 5.722

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Results

\sqrt{s} GeV	183	161-172	130-140	91
$\int \mathcal{L} dt pb^{-1}$	52.22	21.15	12.05	79.74
ϵ_{trig} (%)	78.6 ± 1.1	82.6 ± 1.8	83.0 ± 2.4	87.2 ± 1.0

Electrons

N _{obs}	301	118	55	210
N _{exp}	294	117	46	144
N _{bkg}	127	54	22	98
Π_{elec} (%)	86.4 ± 1.5	80.1 ± 1.8	86.1 ± 1.5	86.1 ± 3.3
ϵ_{elec} (%)	23.4 ± 1.0	22.2 ± 1.0	18.7 ± 2.1	11.9 ± 1.2
Π_{charm} (%)	58.5 ± 2.1	54.8 ± 2.3	59.5 ± 5.5	55.6 ± 4.8
ϵ_{charm} (%)	0.56 ± 0.03	0.54 ± 0.03	0.49 ± 0.07	0.28 ± 0.04

Muons

N _{obs}	52	17	-	62
N _{exp}	42	16	-	48
N _{bkg}	18	8	-	26
Π_μ (%)	100.0	100.0	-	100.0
ϵ_μ (%)	33.4 ± 1.5	33.4 ± 1.5	-	33.4 ± 1.5
Π_{charm} (%)	59.7 ± 6.0	56.8 ± 5.8	-	66.7 ± 9.6
ϵ_{charm} (%)	0.07 ± 0.01	0.07 ± 0.01	-	0.07 ± 0.02

Results

Cross section of Charm Production in $\gamma\gamma$ Collisions

$$\sigma = \frac{N_{sel}}{\mathcal{L}} \frac{\Pi_{charm}}{\epsilon_{charm}}$$

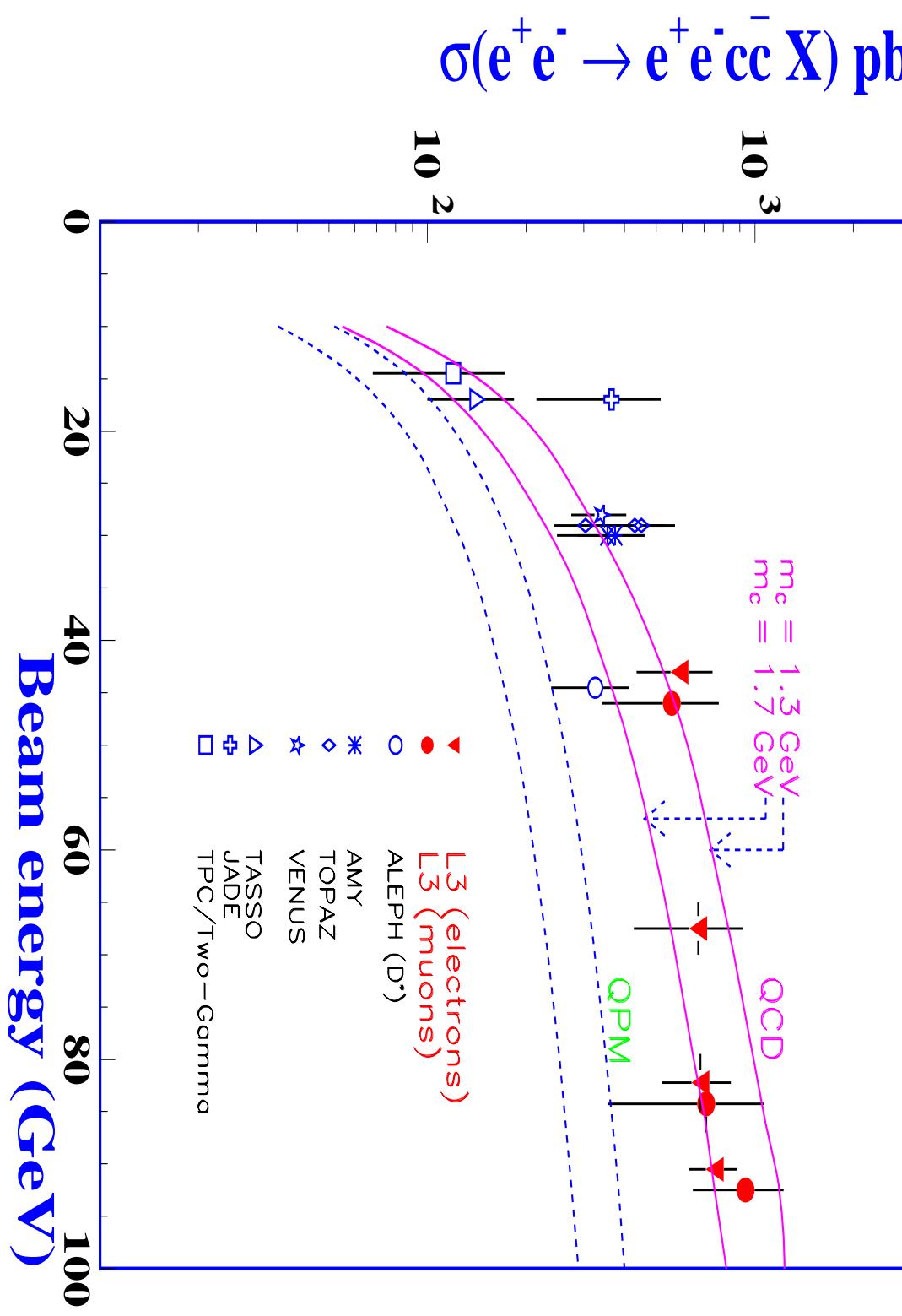
□ $e^+e^- \rightarrow e^+e^-c\bar{c}$ (**Electron Tag**)

$$\begin{aligned}
 \sigma_{183 \text{ GeV}} &= 755 \pm 75(\text{stat}) \pm 102(\text{syst}) [\text{pb}] \\
 \sigma_{161-172 \text{ GeV}} &= 682 \pm 116(\text{stat}) \pm 114(\text{syst}) [\text{pb}] \\
 \sigma_{130-140 \text{ GeV}} &= 672 \pm 153(\text{stat}) \pm 191(\text{syst}) [\text{pb}] \\
 \sigma_{91 \text{ GeV}} &= 589 \pm 76(\text{stat}) \pm 134(\text{syst}) [\text{pb}]
 \end{aligned}$$

□ $e^+e^- \rightarrow e^+e^-c\bar{c}$ (**Muon Tag**)

$$\begin{aligned}
 \sigma_{183 \text{ GeV}} &= 936 \pm 228(\text{stat.}) \pm 178(\text{syst}) [\text{pb}] \\
 \sigma_{161-172 \text{ GeV}} &= 711 \pm 330(\text{stat.}) \pm 134(\text{syst}) [\text{pb}] \\
 \sigma_{91 \text{ GeV}} &= 558 \pm 139(\text{stat.}) \pm 166(\text{syst}) [\text{pb}]
 \end{aligned}$$

Results



Analysis

$D^* \pm \rightarrow D^o \pi_s^\pm \rightarrow K^\mp \pi^\pm \pi_s^\pm$

L3 PRELIMINARY
DATA 183 GeV

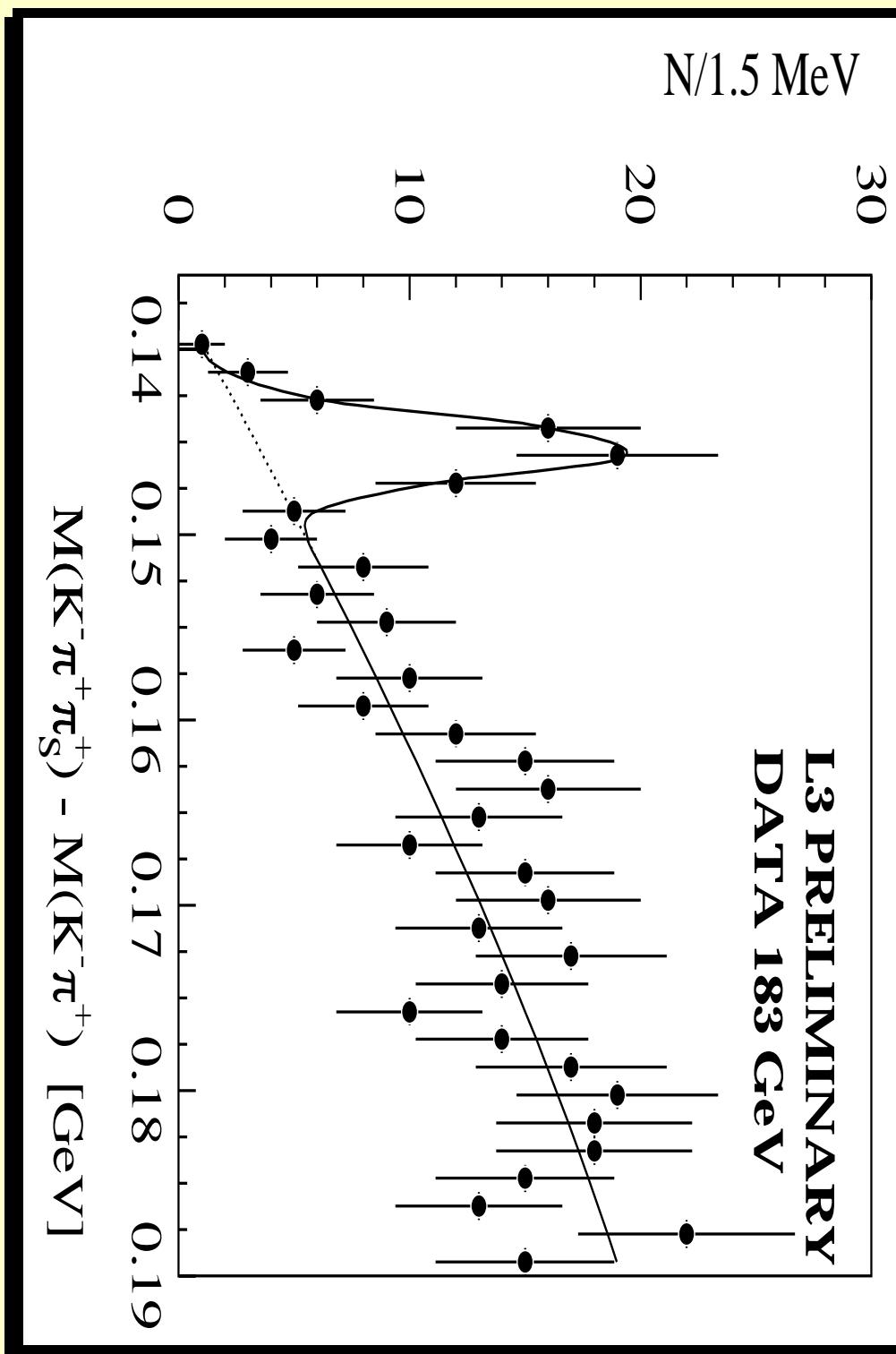
N/1.5 MeV

30
20

10

0 0.14 0.15 0.16 0.17 0.18 0.19

$M(K^- \pi^+ \pi_s^+) - M(K^- \pi^+) [GeV]$



Conclusion

- ❑ Cross Sections of inclusive charm production in $\gamma\gamma$ collisions have been measured with L3 detector at LEP1, LEP1.5 and LEP2 energies using lepton tag.
- ❑ Results are in agreement with QCD predictions.
- ❑ Additional Charm Tag analyses are in progress.
- ❑ Results are Preliminary.